Popcorn Ash at Bowen Power Plant: Experience and Removal Strategies

NETL / DOE

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Marie Craig, Southern Company
Chris Ayers, Enerfab Inc.
Larry Bohannon, Georgia Power
Dr. Klaus Weigl, Envirgy GmbH

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PRESENTATION OUTLINE

- Plant Bowen Plugging History
- Investigation Behind Plugging
- Laboratory Catalyst Rejuvenation Tests and Results
- Technological Solutions
- On-site Catalyst Rejuvenation Process
- Catalyst Rejuvenation Results and Conclusions

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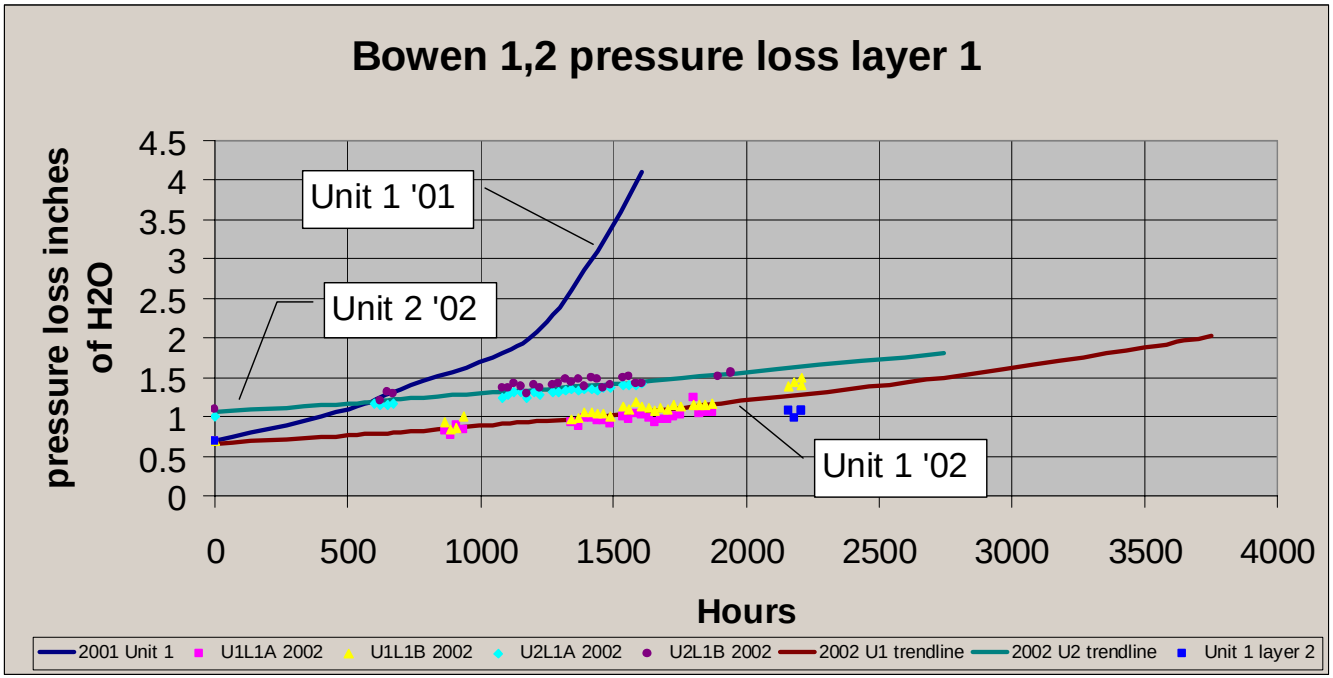
GEORGIA POWER PLANT BOWEN FACTS

- Four (4) CE (Alstom) T-fired units
- 3200 MW Total Operation
- Central Appalachian Coal (KY)
- Units 1 and 2 each 750 MW equipped with SCR systems in Spring 2001
- SCR are 3+1 layer reactor design
- Cormetech 7.1mm pitch honeycomb catalyst

PLUGGING HISTORY



UNIT 1 – Placed in service May 2001. ΔP increased from 0.7 to 4 inches H_2O within 69 days (~1650 hours)

UNIT 2 – Placed in service July 2001. An increase in ΔP caused the plant to take Unit 2 SCR offline after ~1464 hours.

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PLUGGING HISTORY

After the SCR was brought offline:

Observations:

- No significant ash buildup on the screens.
- Catalyst channels plugged with fly ash and large particle ash
- Gradient of pluggage across the reactor

Actions:

- Screens were removed
- "In-situ" cleaning performed
- Units operated remainder of ozone season.

TOP CATALYST LAYER

PLUGGING HISTORY

After the 2001 Ozone Season:

- Layers 1 and 2 of Unit 1 were replaced with new catalysts
- Economizer outlet baffle plate installed
- Units 1 & 2 operated entire 2002 Ozone Season

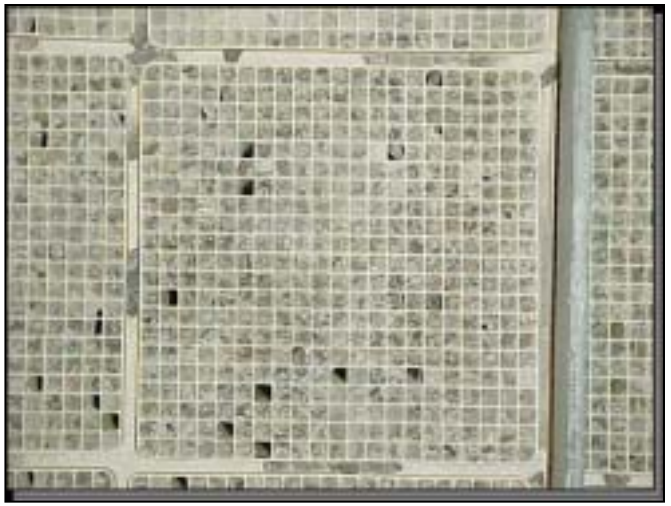
Post 2002 Ozone Season:

- Amount of pluggage decreased, but was still significant
- Southern Company establishes task force to investigate solutions

INVESTIGATION BEHIND PLUGGING

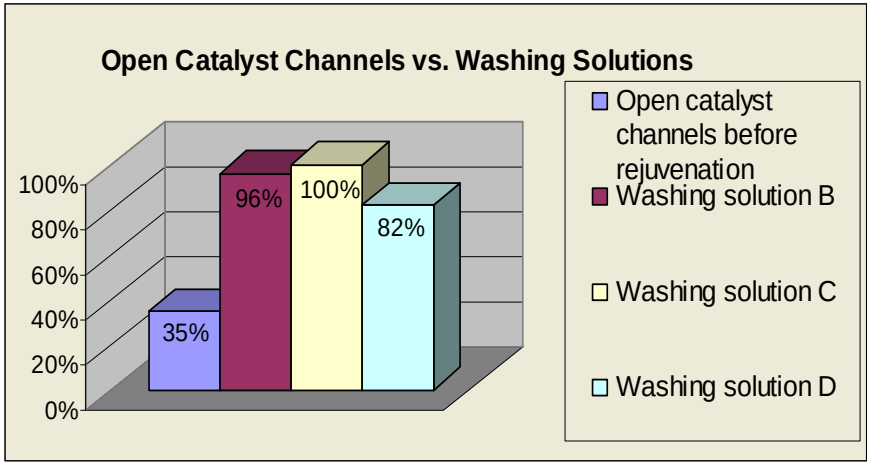
- Popcorn / large particle ash develops from ash deposits on the boiler tubes.
- The deposits on the boiler tubes hardens and breaks off.
- This hardened LPA is easily carried over into the SCR.
- Other operating parameters
- SCS investigates short and long-term solutions

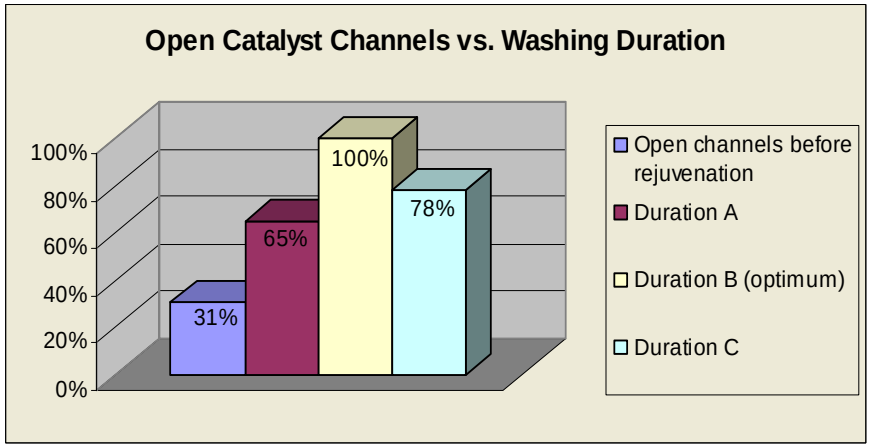
➢Task Force recommends catalyst “rejuvenation”



LABORATORY TESTING

- Envirgy and Enerfab to perform laboratory tests on plugged Bowen catalyst
- Test locations: Vienna, Austria and Cincinnati, OH
- Patented “oscillation” process proved successful during the tests
- Process optimization using different solution additives
- Test results: >95% open channels





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TECHNOLOGICAL SOLUTION

• Based on the laboratory testing performed by the team of Envirgy and Enerfab, Southern Company decide to enter into an agreement for the rejuvenation of the Plant Bowen catalysts.

•Decision Factors: cost, schedule, on-site process

•Removal and reinstallation of the catalyst modules awarded to Enerfab

• "Total Scope" approach led to an efficient and flexible schedule which met Southern Company's needs.

•Envirgy and Enerfab guarantees:

- Catalyst restored to >90% open channels
- No influence on physical or chemical properties of the catalyst
- Removal, regeneration and reinstall per contract schedule

CATALYST REJUVENATION PROCESS

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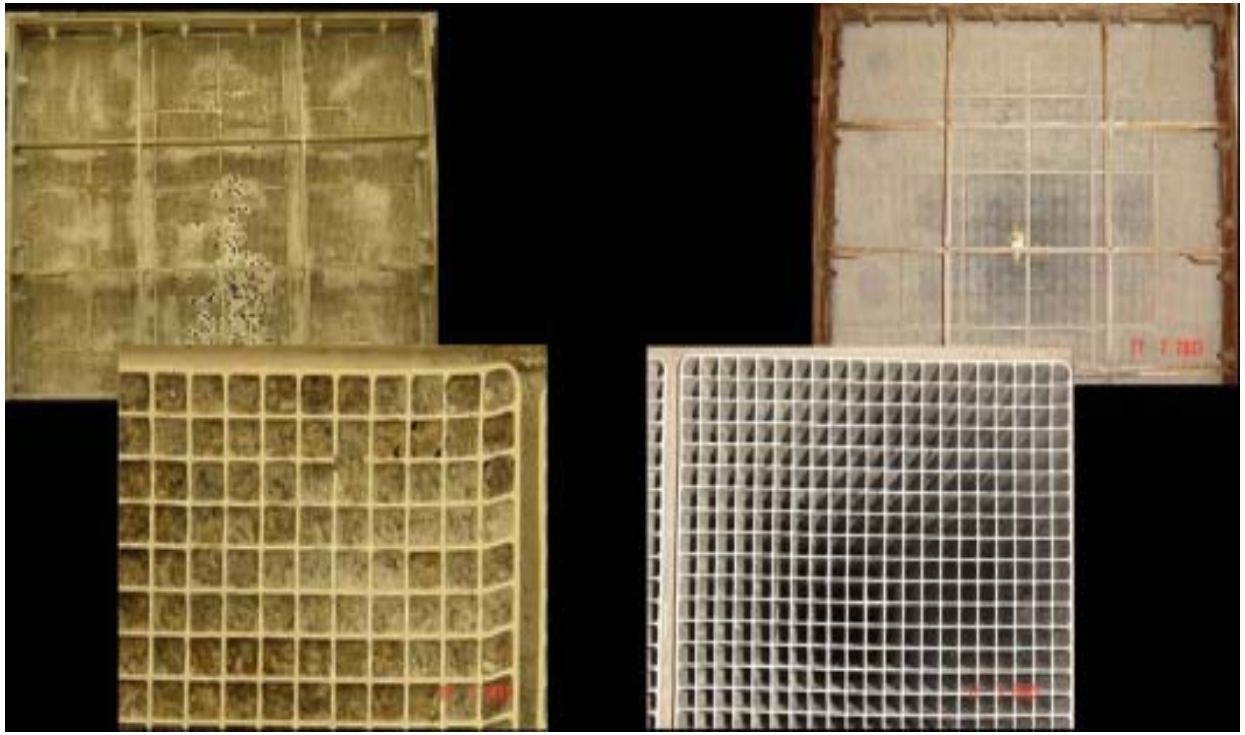
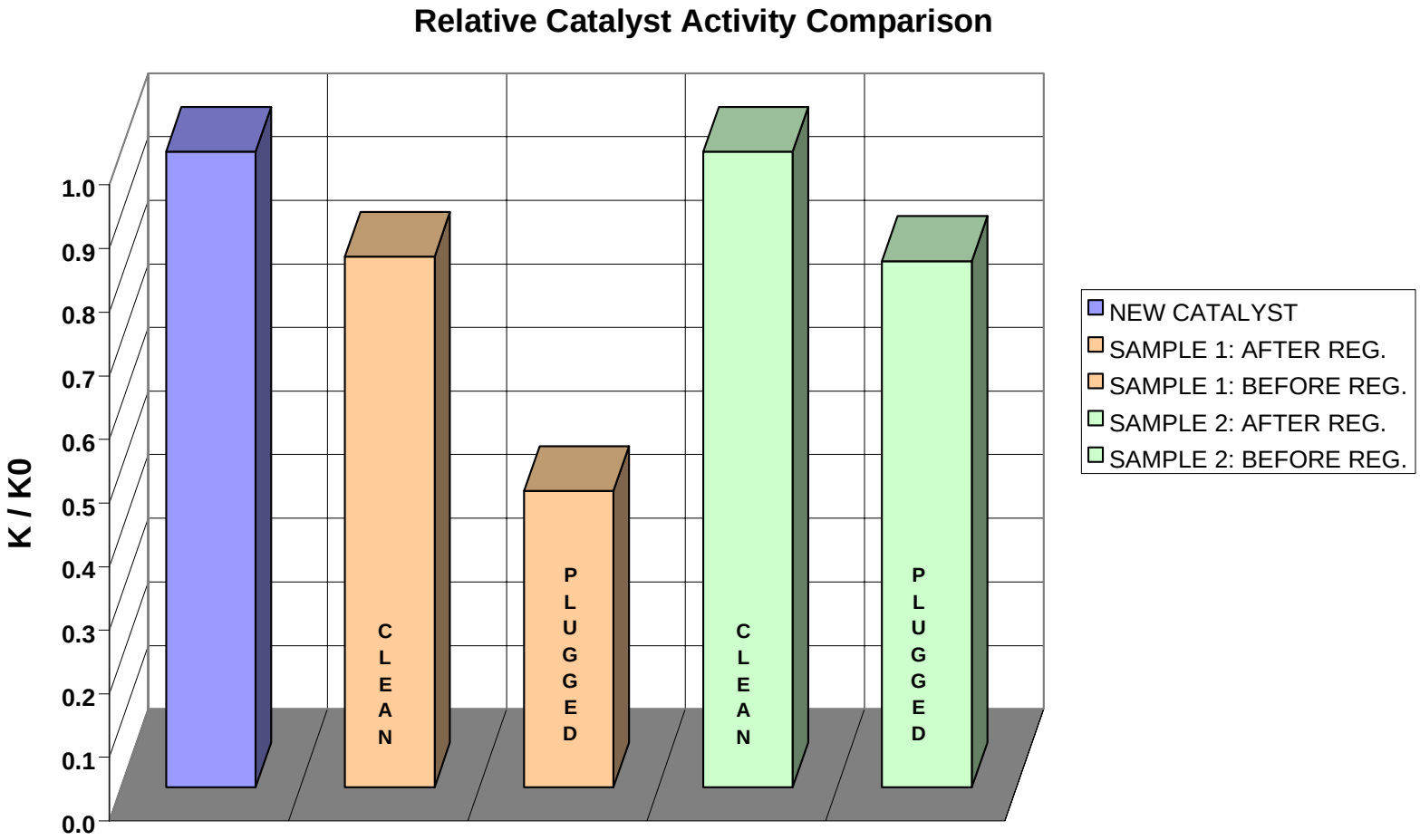
CATALYST REJUVENATION RESULTS



- Achieved > 95% open channels
- No influence on the physical properties of the catalyst
- No influence on the chemical properties of the catalyst
- Met contract schedule

CATALYST REJUVENATION RESULTS



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CATALYST REJUVENATION CONCLUSIONS

<u>"On-site" Catalyst Rejuvenation Benefits:</u>

- No negative impacts to the physical or chemical properties of the catalyst
- Can extend the life span of a catalyst
- Can be successfully performed within a specified time frame.

➢Rejuvenated catalyst performed successfully the entire 2003 Ozone Season.

➢Cost effective solution as an integral part of a Catalyst Management Program.